EPD: Society and Space

Toxic sights: the spectacle of hazardous waste removal

Journal:	*Environment and Planning D: Society and Space*
Manuscript ID	EPD-2019-0068.R2
Manuscript Type:	Article
Keywords:	materiality, removal, waste, representation, chemical geographies, pesticide

Toxic sights: the spectacle of hazardous waste removal

Abstract

This paper examines the geographies of hazardous waste removal. Over the past decade, studies of disposal have demonstrated the myriad ways in which things can never disappear – they can only be transformed, transmuted, combusted, combined or any other manner of material change. This paper aims to develop understandings of the material politics of disposal by considering the matter of representation. It does this ethnographically, by following a chemical stockpile though the process of removal from its storage site in coastal Tanzania. In examining everyday disposal practices, this paper highlights the materialities of hazardous waste in ways that have been epistemologically side-lined. Locating the analysis at the intersection of matter and representation, the paper illustrates the centrality of paper-work, diagrams, photographs, and standard operating procedures in performing removal. It argues that removal is achieved through a bureaucratic spectacle; a process which obscures lingering residues and compounds their toxic effects. By attending to chemicals through the mundane work of removal, this paper opens up different lines of inquiry for studies of waste, and enriches understandings of materiality by considering how visual representations operate and make a difference.

Key words

Removal, materiality, representation, waste, chemical geographies, pesticides

Introduction

This paper aims to extend understandings of the material geographies of hazardous waste disposal. It concerns the stuff of representation, in particular, how visual representations shape the materialities and material politics of removal. Toxic spaces are broadly conceptualised as being 'out of sight' (Davies, 2019). But out of sight to whom? Geographers have started to respond to this question and are demonstrating the ways in which those living and working closest to pollution are acutely aware of its effects (Balayannis, 2019; Davies, 2019). This paper enriches the growing analysis of the visual dimensions of toxicity by examining how contaminated sites are *made* invisible. This unsettles the ontological assumption that chemicals have inherent in/visibilities. Located analytically at the intersections of materiality and visuality (cf. Rose & Tolia-Kelly, 2012), this paper examines the mundane work of removal. It attends to visual representations through the practices in which they are made and circulated. These taken-for-granted practices matter because 'the details matter' (Haraway, 2016: 115); removal practices are crucial points for analysis because they can be sites for managing and governing chemicals differently.

This paper follows the removal of a chemical stockpile from its storage site in coastal Tanzania. Its origin was Greece. This stockpile arrived in the village of Vikuge in 1986 amid broader flows of hazardous discards from Europe to Africa at the time, as the miracles of 20th century chemistry became monsters of modernity (see Clapp, 2001). Because of its persistence and toxicity, the Nobel prize-winning pesticide is now severely restricted from production and use, but chemicals do not just disappear after being banned. Especially chemicals *designed* to linger. The 220 tonnes of expired pesticides were initially stored in an open-air shed on a state-owned hay farm. Like countless other cases of toxic waste dumping at the time, there were no legal mechanisms for regulating the transboundary movement of hazardous materials (see Müller, 2019). This was unjust but not illegal. The stockpile at Vikuge farm is one of countless others located in Tanzania and across the continent. The circumstances of emergence differ from one stockpile to the next, but like all hazardous waste, their effects are raced, classed, gendered, and situated in colonial histories (Nunn, 2018). This was an exploitation of loose regulatory structures (see Elibariki & Maguta, 2017) underpinned by 'racialised disregard' for lives (Williams, 2018); a form of toxic waste colonialism (Pratt, 2011).

In 2012, the stockpile was removed from Vikuge farm and shipped to Poland to be incinerated as part of the Africa Stockpiles Programme (ASP). This continent-wide obsolete pesticide

disposal project was led by the World Bank and involved a constellation of public and private organisations (World Bank, 2013). Since their arrival at the farm the pesticides had been leaking through their broken containers, seeping through the sandy topsoil and into the ground water. As persistent organic pollutants, these pesticides would have also exceeded the village; moving through hydrological cycles, food webs, and trade networks across the country. David Naguib Pellow (2007: 171) wrote of this return-to-sender programme as the intervention was unfolding – with a sense of hope, he argued that the ASP 'represents the successful institutionalization of activist tactics'. However, in practice much of the Programmme was ultimately shaped by the agrochemical industry, or public servants with industry backgrounds. This paper demonstrates how this has had an impact on the work of removal.

Haji, a Tanzanian environmental scientist, took me on a tour of the site in early 2017[1]. The shed smelt noxious. The walls bore strange brown patches, marking hundreds of tonnes of pesticides spilling against the surface for decades. The crumbling concrete floor was covered with dead animals: birds, moths, snakes, frogs and rats. Haji explained that they were poisoned by pesticide residues. Over the past decade chemists have evidenced how DDT residues persist and accumulate in the bodies of plants, water, and soils at this farm, despite the removal of the stockpile (Mahugija et al., 2015). There is also evidence that the chemicals have affected the human population of Vikuge. The key concern for this paper, is that in terms of the ASP this stockpile is considered to be removed. The site is even mobilised by intergovernmental agencies through reports and assessments as an exemplar of good chemical stockpile management. Before-and-after photographs, such as the one below, are a key form evidence used to make this claim.

[Figure 1: 'Before and after' photographs. ASP evaluation report, NEMC. 2013. Photographer/s: unknown. Source: Scanned from NEMC archive. Tanzania.]

This paper tells a story of the spaces in-between.

So, *how* was removal performed? What is removal? And what are the ethical implications of this process? Hazardous site interventions have long been subject to critique within the humanities and social sciences – particularly environmental justice scholarship (see Beckett and Keeling, 2019). Site remediation is a lucrative industry (Krupar, 2011) and the contract to remove the stockpiles at the centre of this paper was worth 3,402,144 US Dollars. Environmental justice work has documented how interventions function to *reinforce* injustices and relations of domination (see Pellow, 2007). However, the practices of interventions and the materialities of contaminants have been epistemologically sidelined. For example, political analyses of pollution at Hunter's Point Navel Shipyard in the US, take care to situate racialised exposures with other forms of embodied racism (Dillon, 2014). This is pivotal environmental justice work. But it has yet to examine *how* remediation takes place in practice. Experiments with chemo-ethnography mark a shift to situated engagements with chemicals (Shapiro and Kirksey, 2017), but examinations of chemical waste still largely unfold at a distance from their material geographies. A significant concern, as different materials have different material politics (Liboiron, 2015). Excluding the practices through which disposal is performed, limits understandings of how disposal fails.

The matter of removal

Materialist research on disposal has explored removal empirically, as a practice of moving matter from one place to another. From here to there. Disposal in this field of research is imagined as liminal, non-linear, and always provisional (see Hetherington, 2004). Removal has been examined as a practice, or a subset of activity within other, seemingly broader, disposal processes. In terms of hazardous waste, it is imagined as the movement of materials from a site of storage, to either a site of destruction (Gregson et al., 2010b), a site of re-valuation (Gregson et al., 2010a), or a secondary storage site (Krupar, 2013). This work attends to the instability of matter and highlights lingering residues. This provisionality of removal is the intellectual point of departure for this paper, but in order to attend to the stockpile more carefully, I elevate removal from practice to process; an assemblage, or coming together of things, cultures, economies, regulatory landscapes, and bodies (Bennett, 2010).

Disposal geographies draw on assemblage to expand the range of actors which matter in waste economies (Gregson and Crang, 2010). I use assemblage thinking to pursue two specific

methodological objectives. First, to examine to *how* materials are transformed (Gregson et al., 2010b); assemblage attends to the work through which disposal is achieved and maintains coherence (or not). But the success of disposal is always more than material. This brings me to this paper's second use of assemblage – which is to attend to the intersections of matter and representation. In epistemological terms there is of course no representation that is immaterial and no material without representation (Rose and Tolia-Kelly, 2012). I move past the conceptual concern 'of whether the discursive and the material are separate realms' (Daya, 2019: 372), and instead examine what representations *do*, how are they *made*, and how they make a difference (Anderson, 2019). In doing this, I examine removal as a knowledge-producing assemblage; Michelle Murphy (2006: 3) articulates this as a 'technical and social constellation of words, things, practices, and people'. My concern for the representative dimensions of removal within a material geography, matters conceptually because it matters politically. It enables an examination of how this stockpile is dematerialised and rendered absent.

I pursue three arguments, structured around (whilst also unsettling) the linear narrative of removal: first, detailing the practices of planning, preparation, and re-containment, I argue that removal is materially impossible. This speaks to the diverse scholarship on disposal that has demonstrated how things cannot disappear; attending to objects such as ships (Gregson et al., 2010a), clothing (Stanes and Gibson, 2017), electronics (Lepawsky, 2018), and personal belongings (Crewe, 2011), studies of disposal have argued that objects can only be transformed. In the latter half of the paper I then turn to the production and circulation of visual representations made to evidence removal. Extending thinking on the impossibility of disposal, I secondly argue that although the stuff of removal always lingers, waste *can be erased* representationally. Finally, this paper argues that these erasures are achieved through a spectacle – what are imagined here as 'toxic sights'. This play on words points to the violent effects of representation in the material geographies of removal. I conclude with a discussion of how the spectacle works as a form of removal, and consider what more ethical forms of intervention might entail. Let me take a moment to discuss the spectacle before returning to the methods I used to examine the removal process.

Contaminated sites have been understood as being 'deficient' of spectacles (Nixon 2011: 47). But this argument invokes the spectacle though its archetypal form, as a matter of entertainment – news media, television, exhibitions, parades. Extending Marx's ideas of commodity

fetishism, Guy Debord (1970) originally developed a theory of the spectacle to critique the stage of capitalism in which the image becomes the driver of consumption (Krupar, 2018). The spectacle works both to embody and obscure the social relations of production, to the extent where the object is reduced to appearance; the image becomes the object (Catz, 2008). The spectacle obscures, distracts, and depoliticises. The theory has been used to understand a range of institutions and processes, including: childhood (Catz, 2008), political reconciliation (Daigle, 2019), and environmental remediation (Krupar, 2018, 2011). The central critique of the spectacle as a theory is that it can be all-consuming and removes all agency, but my task is not (only) to argue that removal is a spectacle, but to show its cracks and fissures. The spectacle works to conceal the residues of removal, but its achievements are incomplete.

Re-assembling a stockpile

I examine the removal process by 'following' the disposal of the stockpile across time and space (Cook et al, 2004; Gregson et al., 2010a). Hazardous material flows are always uneven, but they rarely follow simple North-to-South waste narratives (Lepawsky, 2018). The ethnography spanned Greece, Tanzania, Poland, Belgium, Sweden, and the United Kingdom, assembling a material biography of unending transformation which extends over thirty years. Following chemicals makes for a particularly patchy ethnography and is perhaps best imagined as following *residues*. I approach the removal process by engaging with the people and organisations which participated in the ASP, including government agencies, universities, intergovernmental organisations, NGOs, chemical manufacturers, and disposal companies. Through interviews, participant-observation, photography, and archival work, I attended to participants' material and representational practices with pesticides (cf. Rose and Tolia-Kelly, 2012).

Central to the removal process is a diary maintained by the manager of the waste disposal team contracted to remove the stockpile. Its excerpts feature throughout the following section. Archived at the company headquarters in Wales, and downloaded by the manager onto my flash drive, the diary and the files which accompany it – including photographs, reports, plans, and legal documents – have been mobilised as evidence of removal. This archive commands what takes place, where, and how (Povinelli, 2016). My positionality was central to gaining access to the archive and corporate spaces of knowledge production more generally; my elite institutional affiliation, whiteness, and European citizenship, all afforded an ease of mobility when undertaking fieldwork in 2016 and 2017 (multi-sited ethnography is predicated on this

kind of mobility and is therefore also a shortcoming of the methodology). My access enables this paper to consider *how* claims of removal are made and how matter is left behind. However, telling stories of disposal with bureaucratic documents poses significant dangers. I risk reinforcing the god's-eye view of disposal which underpins standard operating procedures. I also risk compounding the toxic effects of disposal at Vikuge by documenting damage – reducing this place to its toxicities (Murphy, 2017). However, waste management data have a strong capacity to be subverted for critical ends (Rosenfeld et al., 2018). This paper challenges the completeness of removal by re-assembling the mundane materials made to evidence the success of the intervention.

Preparing

> *Saturday 28/07/12*
> *Picked up 07:00hrs. Completed site set up and loaded 1 x FIBC's of DDT.*
> *The emergency shower was too big for the drum but Peter managed to find a reducer locally.*

Preparation, and the planning work which underpins it, is the first stage of removal. It is also non-linear and iterative, extending *throughout* the removal process, so it is therefore important to note an ontological division between planning work and 'doing' work. Planning work is representationally coherent and its intentions drive labour, whereas doing work is located and unruly, often disconnected from intentions. Lucy Suchman (2007: 70) conceptualises doing work as 'situated action'; a form of action which is contingent on the material circumstances in which it unfolds. Planning transformed the messy stockpile of pesticides spilling out into soils, water, and air, into an object of management. It was more than a matter of preparation, it constituted an ontological (re)structuring of space and time. The stockpile was rendered removable. It became fixed in place, coherent, and contained. Or put differently, with different ethical implications, planning and preparation severed the stockpile's relations.

Preparation was based on a set of 'best practices' set by the FAO in their Environmental Management Tool Kit for Obsolete Pesticides (EMTK). Published in four hefty volumes, the kit includes data collection methods, risk calculation formulas, and emergency plans. This is the foundation of removal. Helen, a senior member of the Pesticide Action Network (PAN), managed stakeholder engagement for the ASP and established measures to prevent the emergence of new stockpiles. Helen was frustrated with the lack prevention activities within

this model – for her, the emphasis on removal avoids the uncomfortable politics of supply-driven pesticide economies (see Robbins, 2007). Disposal activities received the lion's share of the ASP funding and Helen explained this is because removal has 'tangible' outcomes: 'with the disposal side of things its very sort of black and white', she explained, 'it's a very tangible, clear output that you've disposed of X tonnes'. Those doing the work of removal shared Helen's view of their work. The emergence of stockpiles was not a supply-side concern for those in the pesticide and disposal industries; shifting responsibility onto farmers, they argued it was largely a matter of stock mis-management. Helen expressed her concerns during my stay at her home – remaining careful not to sound critical of her colleagues:

> They developed a very… structured approach to the whole disposal process. Which makes sense, you know, you do your inventory, you do it in this way, you do your risk assessment, you repackage, and it's a real, you know, it's very prescriptive. And that suited them, in the sense that they were industry guys – they had an industry background – and they were specialists on disposing of this stuff in compliance with international law. But they were not terribly… well, their expertise was not on the sort of broader picture about prevention.

The first country-wide inventory conducted in Tanzania included an assessment of the categories, quantities, and conditions of pesticides. Typically conducted by consultants, the aim is to assess the risks of stockpiles and rank their prioritisation for intervention. Methodologically, inventory calculations are largely speculative encounters – referred to as 'indicative inventories' by those working in stockpile management. The Vikuge inventory was calculated using the spatial dimensions of the shed, combined with whatever materials could be observed through its doorway; this was a visually grounded task. Observations of containers and sacks became proxies for pesticides. As the building was packed from wall to wall it was impossible to assess its contents in any detail. Daniel, one of the field managers for the ASP employed by the Tanzanian Government's National Environmental Management Council (NEMC), explained the inventory methods:

> We had a chemical team who did an inventory, indicative inventory […] You see a bag is 50kg, you approximately say, "How many bags do I have here?" This is mathematics, I think. If I have 10 bags, okay, let's say I have 600kg. We did the whole country.

The Vikuge stockpile was categorised as a high-risk site due to the scale of the pesticides, but ultimately it was a strong candidate for removal due to its capacity to be removed. The site had better access to infrastructure than other stockpiles in Tanzania – particularly its proximity to major highways and the country's main shipping port. Editha, a public health researcher working for a Tanzanian environmental NGO explained that more remotely located pesticide stockpiles had been excluded from the ASP, and that the most hazardous stockpiles are likely to never be removed. Stockpiles vulnerable to collapse are, in part, avoided as a removal attempt could produce new acute exposures if a spill occurs in transit. Leaving a deteriorating stockpile in place can be the least-hazardous form of pesticide management. It is also the least expensive option from a donor perspective, although those living with the stockpile bear the cost in this risk-management scenario.

In these messy material geographies zoning makes removal actionable. Three zones were demarcated at Vikuge, using the EMTK model (figure 2): Zone 1a, the 'Hot Zone', was the acutely toxic space inside the shed; Zone 1b was an extension of the shed made of plastic polyethylene sheeting stapled onto a wooden frame – this liminal zone was a (mostly) sealed space where pesticides were re-contained into 'safe' mobile bundles; in Zone 2, workers de-contaminated themselves, leaving behind their protective equipment so they could enter Zone 3 – the 'Clean Zone'; this outermost zone was a space where workers were assumed to be safe. However, Zone 3 was an entirely superterranean space. The soils and groundwater were contaminated during removal, and still were during my visit in 2017. I was even warned by a chemist not to 'disturb' the soil during my visit. This infrastructure enabled a discourse of containment, but in practice there were no hard boundaries between 'clean' and 'toxic' spaces.

[Figure 2: Diagram of site zones. From 'Site Specific Health Safety & Environment Management Plan'. 2012. Source: PDF in Veolia archive. Wales.]

Impermanent flooring was a foundational dimension of the physical infrastructure, enabling the operation of heavy equipment such as forklifts and trucks. New floors made of plywood and polythene plastic were installed around the shed's perimeter to provide a stable working

surface and a barrier between the pesticides and the soil. Alan and James, employees of Veolia Field Services who were hired to remove pesticide stockpiles in Tanzania, explained 'it won't let anything through'. However, despite the installation of a multi-layered barrier, contaminated water still spilled into the topsoil. James showed me photographs of workers precariously de-contaminating their suits in 'washbowls' – ostensibly large plastic buckets of water. The contaminated water splashed out, through the boards, onto the polythene underlay, and eventually into the soil. Physical infrastructure brought the zoning imaginaries to life, but it was also continually tested by the recalcitrance of matter and the situatedness of 'doing' work.

For the team of eight workers Personal Protective Equipment (PPE) was the most important element of the infrastructure. Supervised by Alan, the team was hired locally in Dar es Salaam and did not require experience or knowledge of hazardous waste management (raising questions around the precarity of this labour). Workers instead participated in an intensive training program on risk management run by the company. Coveralls, rubber boots, heavy gloves, and full-face masks with filters were required as the pesticides were in powder form and easily become airborne. Removal work is also men's work. The gendered division of labour is evident in other sites where pesticides feature in the workplace – particularly agriculture. Men are imagined as being more capable and able to bear the effects of exposure, and as a consequence, women's (seemingly) indirect exposures are overlooked (Nyantakyi-Frimpong et al., 2016). The uneven lines of exposure in disposal were unclear. The only exposures accounted for were the bodies of those employed to perform the work of removal. Those living in Vikuge were zoned out of the site spatial imaginary.

Re-containing

> *Monday 30/07/12*
> *First day of bagging. Split team into 2, both [t]eams did two sessions in zone 1 the rest of the time in zone 2. Total of 12 x FIBC filled. Need to get this up to at least 15. Spoke to Alfred and Dom about a few ideas to achieve this which we will try tomorrow […].*

Anticipating the recalcitrance of pesticides, re-containment is designed as a repetitive three-stage process. The initial round aimed to make the heterogeneous mass of matter mobile. The first storage shed collapsed in 1996, and the pesticide bottles and powder were moved into

twenty-five-kilogramme sacks and stored in the new purpose-built shed funded by the Swedish International Development Agency (SIDA). How this work took place is uncertain. Nordic states and the World Bank have a long history of intervening in Tanzanian politics through development aid (Pallotti, 2017), however the SIDA archives have no record of this intervention. Over the past two decades these sacks severely deteriorated and pesticides were spilling out of their containers. The removal team worked across twenty-four days – six days per week with Sundays off – to re-contain these pesticides with shovels and hands. James explained the messinesss of this process:

> When it's a stockpile, it tends to be in packages that were adapted for end use. So, often that means, small volume, easy to handle packages. One litre, five litre, ten litre, maybe up to twenty-five litre, twenty-five kilo packages. Which are great if you're an end user, but it's exactly what we don't want, if you notice, if you want to transport and ship material for destruction. You want it in a unit load that's much more adapted to shipment. Which means palette loads, which means drums or cubic metre units. So, because of the way the material has been packed for end use [it] often magnifies and increases the amount of handling and work we need to do on-site to render that material suitable for transport […] it's lots of, lots of, lots of messy handling work.

Veolia were contracted to only remove 'surface level stocks'. But the line between surface and stockpile had disappeared over the past twenty-six years. The demarcation of the stockpile in the field was messier than the hard lines of the diagram. Daniel (partly) jokingly explained that decision-making about what to 'bag' and what to leave behind was based on the ratio of pesticides to soil; the 'surface' was determined on site through an informal rule – if a patch of soil appeared to be over fifty percent constituted of pesticides, then this was a part of the stockpile. Anything less, and the material was merely 'pesticide contaminated soil' and had to be left at the site. Daniel described the ways some patches of soil were so contaminated that they were better imagined as 'soil contaminated pesticide' rather than 'pesticide contaminated soil'. The line between contaminant and contaminated is blurry and always changing. Daniel called this 'working to assumptions'.

The first stage of re-containment occurs in the Hot Zone. This limits the (unintentional) spread of pesticides outside shed, but it is a hazardous environment for the workers doing the re-containing. The team faced multiple routes of potentially lethal exposure, including inhalation,

ingestion, and skin contact. James showed me videos of workers handling the pesticides on his desktop computer in his office in Wales. Every inch of skin was covered and each breath was filtered through a ventilator. Alan supervised the team at the site and created the videos of the removal operations. He apologised for their quality – 'I'm not a photographer', he explained. Despite their blurriness, Alan's images give a textured understanding of the unruliness of the stockpile (figure 3). Some sacks were so severely degraded that they fell apart when lifted, creating plumes of pesticide as they collapsed on the concrete floor.

Standard operating procedures were revisited and revised, with materiality of the pesticides in a feedback loop with the infrastructure of removal. The team's risk management plan specified that workers must lift the sacks in pairs, but it was difficult to share the load that had severely degraded. Heavy yet fragile, workers could not help but use their bodies to take on the load. James explained that even with the most experienced crew, it is a force of habit to hold fragile sacks close to the body. But when moving pesticides this habit is risky. The coveralls were made of high-density flashspun (i.e. nonwoven) polyethylene fabric that is tear-resistant and waterproof. But this fabric can be easily cut with a sharp object – a problem when moving a stockpile filled with shards of old glass pesticide bottles. The team improvised, adding a PVC apron to provide a secondary layer between the pesticides and their bodies.

[Figure 3: Video still of workers containing pesticides in shed. 2012. Photographer: Alan. Source: Veolia archive. Wales.]

I was surprised to see the material proximity, even intimacy, of this work – expecting to see the more automated forms of labour that figures prominently in promotional representations of stockpile removal on the FAO website. This is the work of hands, shovels, and chests; in James' terms, a 'very hands-on process'. Despite the toxicity of this environment, the more-than-chemical risks were a greater matter of concern for the team. The messy materiality of the stockpile made handling heavy and unpredictable. Sprains, strains, and trips in a disorderly enclosed environment were the more likely occupational hazards. The archived risk assessment that James downloaded onto my flash drive at Veolia outlined these 'other' risks at this site, including heat exhaustion and poor visibility. It is slow and arduous work. During my visit to the shed in early 2017, the smell was also intensely noxious – even though the stockpile had

been removed. In the aptly named Hot Zone it was difficult to move, difficult to see, and from the muffled voices in Alan's recordings, it was also difficult to hear.

> *Friday 21/09/12*
> *Visit Vikuge to see Thomas. Most bags double stacked but two bags were leaking and had to be repacked.*

The second iteration of re-containment involves placing 'small bags' into 'big bags' – one-tonne Flexible Intermediate Bulk Containers (FIBC) – to form bundles of sacks. When filled, each FIBC was weighed, and topped up if necessary, to maximize the use of the shipping container. However, the cumbersome materiality of the big bags (unlike smaller and harder steel drums) made them difficult to handle. Temporary flooring is also not an ideal surface for a forklift to move big bags, which on average weigh eight to nine-hundred kilogrammes. The team explained that FIBCs are used in removal because they are the most 'cost-effective unit load' due to the way their rectangular shape fills the shipping container. Drums on the other hand, create 'lost space' and require a greater number of containers for shipment. Space becomes highly valuable when the stockpile enters shipping networks. Neither James nor Alan expressed that these containers were a less-safe method of moving pesticides. James stressed their containers 'are made to a UN standard certified for carrying dangerous products'. However, despite this commitment to the integrity of the regulatory landscape, the removal diaries detail the leakiness of the FIBC.

When the big bags were forklifted out of the shed, the discursive power of zoning procedures comes into force. The zones became embodied in the plastic sheeting, plywood, and practices of personal protection. The informational dimensions of planning and preparation materialised in the physical infrastructure, which in turn shaped the talk of the project: 'inside' was toxic, 'outside' was clean. Although the Veolia team knew these pesticides had been seeping into the soil – and they would have no doubt seen dead animals at the site during the process of re-containment (just as I had during my visit) – there was a sense that the stockpile had been successfully contained. As I watched the videos of workers moving the big bags, James explained the process of transformation with a sense of pride in the team's achievements:

> So you saw what was inside, now you can see straight away that actually what's actually coming out of the store, is clean, it's packaged, it's ready to roll. So, I mean

> the way this whole system [is] working is that you keep the contamination inside and you don't bring anything outside.

Once the pesticides were re-contained and stored in Zone 2, the shed was 'cleaned'. This involved vacuuming fragments of containers and powder; chipping off highly contaminated parts of the concrete floor; and using a jet washer to wash the floors and walls with soapy water. After each shift the workers would also wash their suit using the 'triple-rinsing method'. This washing does not constitute not decontamination, only dispersal. With no access to running water the standard operating procedures of de-contamination also had to be adapted. Triple rinsing typically involves full body showers. For this project, workers splashed water on themselves whilst standing in washbowls. At the end of the project they undertook blood tests to check for the presence of pesticides. James showed me photographs of the decontamination method during our interview and described the process:

> You can see we're, we're in the middle of nowhere, you need something that works – how do you decontaminate guys in the middle of nowhere? There's no water supply, no back-up so it's pretty, pretty basic stuff. They're triple rinsing but it's in its most simple form.

The disposal team ultimately imagined the site as being 'in the middle of nowhere'. This unplaced, unpeopled, imaginary of Vikuge was inscribed in site diagrams, inventories, and the ways in which those living in Vikuge were rendered absent. James explained removal tends to be 'a mobile, go in, get done, get out, type of operation'. This sense of 'nowhereness' which pervades the intervention design and discourse has (neo)colonial overtones. The lines drawn on these diagrams have material effects, regulating bodies and space, making some lives matter and erasing others. These logics and techniques of spatial compartmentalisation have been historically enrolled to rationalise dispossession (Fanon, 1963). For James, this is was a matter of procedure – technical problem with a technical solution. These abstracted understandings are central to the standard operating procedures outlined in the Tool Kit and the ways the activities of the ASP had been promoted by the World Bank. The residents of Vikuge were not involved in the removal planning process as this was a task for 'experts'. Helen explained that in these kinds of interventions meetings are typically held with community members to inform them that although 'men in white suits' would be working at the site, there was no reason for residents to be alarmed.

After the shed was washed the 'big bags' were loaded into shipping containers, taking approximately eight weeks for each shipment to reach the incineration facility in Poland. There was a high risk of spillage in transit so each bag was wrapped with an additional layer of PVC before it was forklifted into the container and fixed in space with a wooden frame. Each filled container weighed up to twenty tonnes. Each FIBC was numbered and labelled with 'universally' recognised waste codes designated by the UN. The packing and transporting processes systematically reduced the heterogeneous store of matter into a line of digits: 2761, Class 6.1. This process of making the stockpile 'legible' (Tsing, 2015) for shipping was discursively violent, but it was also the most hazardous phase of removal in material terms. Containers had to be driven on unsurfaced roads out of the village and then through the notoriously congested streets of Dar es Salaam. Travelling long distances on roads in poor conditions disturbed the volatile loads and created the possibility of a new spill in a new location. James was pleased to report that there were no recorded accidents or incidents, but considering the leakiness of the FIBCs at Vikuge – a time when the bags were comparatively stable – spills on board were likely. Where did these spills happen? What was contaminated? Who was exposed?

Re-presenting

> *Thursday 09/08/12*
> *Sammy came to site, wandered around zone 2 kitted up taking photos. He told me he thought the job was being carried out very professionally as did all who has seen the [Ministry of Agriculture] video.*

As souvenir of my visit to the Veolia headquarters, James gave me a hazardous waste label used to mark containers in transit. The representational dimensions of removal are easy to take for granted, but they are central to the process. Photographs are particularly powerful tools of disposal. The 'clean-up' photographs in the introduction published in a NEMC assessment report are the 'public' face of the stockpile (figure 1). The publics, in this case, being the donors, NGOs, governments, and intergovernmental agencies governing and managing disposal. They are the only publicly available (but not necessarily easily accessible) evidence of the materiality of the stockpile. The report's introduction identifies the pesticides as DDT, although their material form, intended use, and circumstances of arrival at the site are excluded. How the pesticides were removed, where they were sent, and what (and who) was outside of the shed's interior were also omitted. These kinds of images are prevalent in reports, articles,

and promotional materials, published on a range of disposal projects led by-in-large by UN agencies. They frame understandings of what stockpiles are, and in doing so create the conditions for removal.

Before-and-after photographs are powerful forms of evidence, in part because their use extends beyond visual cultures of removal. The juxtaposition of images across time is a ubiquitous visual language that has shaped contemporary imaginations of how events unfold – with the event always missing from the picture (Weizman and Weizman, 2015). This language works by creating bounded 'before' and 'after' worlds, where successful transformations become possible and measurable. Alongside diagrams, photographs are modes of intervention which transform the site, 'rendering' (Myers, 2015) it contained and manageable. The 'before' world reduces the stockpile to a space where the pesticides are coherent and contained. Pesticides are rendered visible in sites where they largely exceed thresholds of (human) perception. Although removal is a liminal space and time in-between, visual representations limit the stockpile to a single site. A bounded problem for a bounded solution. The site is made through these representations; performed as the contents of the shed.

The origin of the materials, how they changed over time, who was exposed to the stuff, and the extent to which the chemicals have moved beyond the shed, are excluded from this world. This resonates with remediation geographies where ongoing colonial relations are typically omitted from the planning process (Beckett and Keeling, 2019). This simplified object of management can be mobilised to speak with other stockpile sites that have also undergone a process of 'clean up' in ASP reports (cf. Latour 1999). However, this requires more than photographs to be effective. The before-and-after images are detached from the text and located appendices, separated from discussions and maps of the places they depict. The caption also works to increase the power of the photograph as evidence (Berger, 2013). Images ultimately gain their evidentiary truth-power through the spaces in which they are circulated (Rose, 2003); like photographs published in scientific journals, the before-and-after images of removal gain their authority by virtue of their position in assessments and reports.

Photography in removal is ultimately a means of control; it is deployed as a bureaucratic tool which 'fragments continuities and feeds the pieces into an interminable dossier' (Sontag, 1979:156). Photography has the power to make reality atomic. This research unearthed the spaces in-between 'before' and 'after', and in doing so, it enabled a re-assembling of fragments. New juxtapositions can subvert the intended function of photographs and destabilise the power

of the archive – as Povinelli (2016 :148) notes, archival power works by 'domiciling space and time'. James shared my assessment of the capacities of these images, which is why I was prohibited from distributing Veolia's videos. I was instead given permission to show stills of the recordings (figure 3). His concern was that the videos could be 'misinterpreted'. They were made with the intention to present the team's mastery over the material world, but at the same time, they demonstrate how removal is unavoidably messy and incomplete. Abstracted from the discursive field of the archive, these videos can be read as failures of the process.

The spectacle of bureaucracy

Despite the lingering residues at Vikuge, this removal project was a resounding success for Veolia. The site is used as best practice for stockpile removal in ASP publications. Considering its partial containment, how was the absence of this object achieved? And for *whom* are these claims of a successful removal made? Participants working for industry, government agencies, and the NGO sector, all recognised that the pesticides and their effects continue to linger in the village. This echoes Strathern's (1999: 61) observations that 'those involved in the activity of waste disposal know that one cannot dispose of waste, only convert it into something else within its own life'. James was troubled by what his team left behind. After our interview at Veolia formally ended, he explained, with a tone of regret, that they should have removed the contaminated soil, but they were not contracted to do so. He was following procedures. His intentions were good – he even had a sense of pride in his team's work – but good intentions are often at the centre of (neo)colonial interventions (de Leeuw et al., 2013; Gahman, 2016).

The visualities of removal obscure the material, economic, and political dimensions of pesticides exceeding the space of the shed. All that comes to matter is the visual evidence of a bounded stockpile. Removal is achieved through the spectacle. Although this spectacle is aesthetically unremarkable. In nuclear waste remediation, nature has been deployed as a spectacle to mask the lingering residues of war (Krupar, 2011), however, the Vikuge stockpile was not dis-placed an awe-inspiring configuration. The tools enrolled to create the spectacle of removal are mundane and ordinary: blurry photographs, partial inventories, out-of-scale zoning diagrams, codes, certificates. This quality makes them appear 'raw' and 'truthful' (cf. Myers, 2015). The outcome of this representational work is an imaginary of empty, ordered space. Absence. The spectacular dimensions of removal are not necessarily the images per se, but the tremendous scale of their production and circulation. I located hundreds of highly-circulated documents emerging from the project – some more directly related to the Vikuge stockpile than

others. And the power of the images escalates through each round of circulation (Latour, 1999). There are also countless other documents archived by the World Bank and FAO that I have not been permitted to access, let alone interpret. The scale of representations is overwhelming and difficult to digest, even for a researcher with a generous fieldwork budget. Removal is a spectacular process, rather than outcome; this is a spectacle of bureaucracy.

The bureaucratic spectacle is more than the stuff of paperwork. These representations haunt governing and management processes. Debord's (1970) theory speaks to the mutual constitution of matter and meaning; the spectacle and the actual are indivisible. The success of this removal project presents a problem for those who work in the field: removal makes stockpiles a quantifiable problem, and the issue with this is that once the quantified pesticides are rendered absent, it is difficult to garner support for less-visually compelling dimensions of the stockpile such as water contamination. Visibility is central to making a problem political and demonstrable (Barry, 2013). The process of removal worked to make this already visually elusive problem less-visible. Daniel complained, with a sense of exasperation, that no funding agency would support 'a problem that they can't see'. The technicians, researchers, and public servants who participated in this research echoed his concern. This is a reminder of Sontag's (1979: 180) warning that photography has the capacity of turning reality into a 'shadow'.

The ASP may not have removed the stockpile from Vikuge, but it has removed evidence of its presence. Drawing on Fanon's (1963) work on the temporalities of colonial violence, Rob Nixon (2011) argues environmental injustice is reproduced through the dissemination of doubt and denial. Now, this particular spectacle of removal is not necessarily a deliberate conspiracy to conceal contamination at Vikuge. The reduction of the stockpile into codes, categories, and snapshots, is necessary for this heterogeneous mass of matter to become legible for globalised disposal economies; classification is a process of translation (Tsing, 2015). The plans, procedures, and practices used in this removal project were designed to be enacted at dozens of other sites across Ethiopia, Tunisia, Morocco, South Africa, and Mali (see World Bank, 2013). However, classification is never innocent. It is has been pivotal to, and coproduced with, colonialism (Tsing, 2015). Shotwell (2016: 24) argues that classification has been a core objective of the colonizing state, as 'it is in part through bureaucracy that colonialism takes form'.

The implications of making disposal scalable, is that the relations which assemble the stockpile are severed in the process. The World Bank has funded the 'solution' but it has also been central

to the problem. International financial institutions drove the growth in pesticide exports to Africa in the late 20th century. The World Bank financed the purchase of $250.8 million worth of pesticides between 1988 and 1995 – largely from chemical corporations in the global North – which were then embedded in international 'development' aid (Pellow 2007). Development project funding is a powerful neo-colonial tool; Langan (2018: 81) demonstrates how it has been used as a way of ''buying' political agendas and policy conformity'. As suggested in Helen's criticisms of the ASP, histories of chemical conditionalities in structural adjustment programmes do not figure in disposal plans. Ultimately, the focus on a 'technical fix' enables the World Bank and the FAO to evade responsibility for enabling toxic waste colonialism across the continent. The broader effects of the ASP on African economies is a matter of concern in need of inquiry – this is a reminder of Nkrumar's (1965) forewarning that neo-colonial interventions are particularly dangerous as they unfold with relatively little accountability on the part of intervening actors.

Conclusion

The importance of visual representation in removal has etymological roots – to remove is to 'put out of view' or move away (OED, 2019). Out of sight, out of mind. At least for those governing disposal. Years after Veolia packed up at Vikuge, the labour of the spectacle continued, with James preventing me from distributing videos of removal-work. In Merrifield's (2004: 328) terms this is how the spectacle 'covers its tracks.' For Veolia, videos and photographs of the workers re-containing pesticides prove that this project was performed successfully and in compliance with regulations. The power of these images emerges from their unending circulation in authoritative reports and assessments (Rose, 2003). Acknowledging the residues of their work, the disposal team asked me to send them photographs of the site when I visited the farm – they were curious to see if life had returned to the contaminated soils surrounding the shed. And life was indeed ongoing at the site during my visit, but so too were the lingering pesticides.

This paper has stressed the importance of 'the details': the fabric used to make hazmat suits matters to removal technicians working with shards of contaminated glass; the fragility of FIBCs matters to dockyard workers in Poland offloading chemical-filled containers; the properties of pesticides matter to the residents of Vikuge who are exposed to them, and will continue to matter for generations to come. The spectacle of removal works by erasing the details and severing relations. Thinking with persistent chemicals highlights the limits of

disposal and the representational work it requires. The bureaucratic spectacle creates a controllable world where matter can be contained, but the boundaries in plans and procedures always lose their coherence. The unruliness of the Vikuge stockpile forces an attunement to how materials exceed containment, asking us to think of hazards in terms of situations instead of territorially bounded sites (cf. Hinchliffe et al., 2013). At best, the removal of this stockpile was tenuous and partial. Inventories, protective equipment, even UN-approved waste containers, eventually fail in practice. But the systems of standardisation and visual representation required for the stockpile to become a legible object of disposal in globalised economies are not only tenuous, they create erasures and exclude those who live with the legacies of DDT.

By pursuing a materially situated account of removal, attuned to the ways matter exceeds containment, this paper offers attentive understandings of hazardous waste that are often sidelined in environmental justice research. Specificities matter, not only because they can make a difference between life and death, but because they can become sites for working with chemicals differently. I conclude this paper then, with a call to work more care-fully with our monsters, and the representations that are made to speak for them. Standardized practices of re-containing, coding, and labelling, all have significant effects in contaminated sites. A quick technical fix designed from a distance – that had no intentions for repair – has worked to erase the toxicity at Vikuge farm and the ir/responsibilities of the World Bank and chemical industries. So, what might different forms of removal look like?

Pollution is always situated in geographies of dispossession, so the starting point must be feminist and anticolonial (Murphy, 2017). Scholars working on anticolonial forms of remediation at mining sites offer a way forward for worlds of chemical waste (see Beckett and Keeling, 2019). Rather than re-producing the hubristic fiction that hazardous waste can be removed, interventions must acknowledge the uncertainty and instability of chemicals; this is a form of environmentally embedded violence which is ‘difficult to source, oppose, and once set in motion, to reverse (Nixon, 2011: 7). The first step is to reject the seductive tangible outcomes that removal offers, and instead think in terms of obligation (cf. Liboiron et al., 2018) – an ethic of remediation. This mode of intervention approaches contaminated sites through an ongoing process of care that is situated historically, involves affected communities, and is grounded in conceptual and ethical frameworks which are located in place (Beckett and Keeling, 2019).

Notes

1. Where requested, research participants' names have been replaced with pseudonyms.

References

Anderson B (2019) Cultural geography II: the force of representations. *Progress in Human Geography* 43(6): 1120-1132.

Balayannis A (2019) Routine exposures: reimaging the visual politics of hazardous sites. *GeoHumanities* 5(2): 572-590.

Barry A (2013) *Material Politics: Disputes Along the Pipeline*. Oxford: Wiley-Blackwell.

Beckett C and Keeling A (2019) Rethinking remediation: mine reclamation, environmental justice, and relations of care. *Local Environment* 24(3): 216-230.

Bennett J (2010) *Vibrant Matter: A Political Ecology of Things.* Durham and London: Duke University Press.

Berger J (2013) *Understanding a Photograph.* London: Penguin Books.

Catz C (2008) Childhood as spectacle: relays of anxiety and the reconfiguration of the child. *cultural geographies* 15(1): 5-17.

Clapp J (2001) *Toxic Exports: The Transfer of Hazardous Wastes from Rich to Poor Countries.* Ithaca and London: Cornell University Press.

Cook et al. (2004) Follow the thing: Papaya. *Antipode* 36(4): 642-664.

Crewe L (2011) Life itemised: lists, loss, unexpected significance, and the enduring geographies of discard. *Environment and Planning D: Society and Space* 29(1): 27-46.

Daigle M (2019) The spectacle of reconciliation: On (the) unsettling responsibilities to Indigenous peoples in the academy. *Environment and Planning D: Society and Space* 37(4): 703-721.

Davies T (2019) Slow violence and toxic geographies: 'Out of sight' to whom? *Environment and Planning C: Politics and Space*.

Daya S (2019) Words and worlds: textual representation and new materialism. *cultural geographies* 26(3): 361-377.

Debord G (1970) *Society of the Spectacle.* Detroit: Black & Red.

de Leeuw, S, Greenwood, M and Lindsay N (2013) Troubling good intentions. *Settler Colonial Studies* 3(3-4): 381-394.

Dillon L (2014) Race, waste, and space: brownfield redevelopment and environmental justice at the Hunters Point Shipyard. *Antipode* 46(5): 1205-1221.

Elibariki R and Maguta MM (2017) Status of pesticides pollution in Tanzania - A review. *Chemosphere* 178: 154-164.

Fanon F (1963) *The Wretched of the Earth*. New York: Grove Press.

Gahman L (2016) White Settler Society as Monster: Rural Southeast Kansas, Ancestral Osage (Wah-Zha-Zhi) Territories, and the Violence of Forgetting. *Antipode* 48(2): 314-355.

Gregson N and Crang M (2010) Materiality and waste: inorganic vitality in a networked world. *Environment and Planning A* 42(5): 1026-1032.

Gregson N, Crang M, Ahamed F, et al. (2010a) Following things of rubbish value: end-of-life ships, 'chock-chocky' furniture and the Bangladeshi middle class consumer. *Geoforum* 41(6): 846-854.

Gregson N, Watkins H and Calestani M (2010b) Inextinguishable fibres: demolition and the vital materialisms of asbestos. *Environment and Planning A* 42(5): 1065-1083.

Haraway D (2016) *Staying with the Trouble: Making Kin in the Chthulucene*. Durham and London: Duke University Press.

Hetherington K (2004) Secondhandedness: consumption, disposal, and absent presence. *Environment and Planning D: Society and Space* 22(1): 157-173.

Hinchliffe S, Allen J, Lavau S, et al. (2013) Biosecurity and the topologies of infected life: from borderlines to borderlands. *Transactions of the Institute of British Geographers* 38(4): 531-543.

Krupar SR (2011) Alien still life: distilling the toxic logics of the Rocky Flats National Wildlife Refuge. *Environment and Planning D: Society and Space* 29(2): 268-290.

Krupar SR (2013) *Hot Spotter's Report: Military Fables of Toxic Waste.* Minneapolis and London: University of Minnesota Press.

Krupar SR (2018) Sustainable World Expo? The governing function of spectacle in Shanghai and beyond. *Theory, Culture & Society* 35(2): 91-113.

Langan M (2018) *Neo-Colonialism and the Poverty of 'Development' in Africa*. Cham Switzerland: Palgrave Macmillan.

Latour B (1999) *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge, Mass.: Harvard University Press.

Lepawsky J (2018) *Reassembling Rubbish: Worlding Electronic Waste.* Boston: MIT Press.

Liboiron M (2015) Redefining pollution and action: The matter of plastics. *Journal of Material Culture* 21(1): 1-24.

Liboiron M, Tironi M and Calvillo N (2018) Toxic politics: acting in a permanently polluted world. *Social Studies of Science* 48(3): 331-349.

Mahugija JAM, Henkelmann B and Schramm KW (2015) Levels and patterns of organochlorine pesticides and their degradation products in rainwater in Kibaha Coast Region, Tanzania. *Chemosphere* 118: 12-19.

Merrifield A (2004) Debord's World. *Environment and Planning D: Society and Space* 22(3): 325-328.

Müller SM (2019) Hidden Externalities: The Globalization of Hazardous Waste. *Business History Review* 93: 51-74.

Murphy M (2006) *Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Technoscience, and Women Workers*. Durham, NC: Duke University Press.

Murphy M (2017) Alterlife and decolonial chemical relations. *Cultural Anthropology* 32(4): 494-503.

Myers N (2015) *Rendering Life Molecular: Models, Modelers, and Excitable Matter*. Durham and London: Duke University Press.

Nixon R (2011) *Slow Violence and the Environmentalism of the Poor*. Cambridge MA and London: Harvard University Press.

Nkrumah K (1965) *Neo-Colonialism: The Last Stage of Imperialism.* London: Thomas Nelson and Sons.

Nunn N (2018) Toxic Encounters, Settler Logics of Elimination, and the Future of a Continent. *Antipode* 50(5): 1330-1348.

Nyantakyi-Frimpong H, Arku G and Inkoom DKB (2016) Urban agriculture and political ecology of health in municipal Ashaiman, Ghana. *Geoforum* 72: 38-48.

OED (2019) *Online Etymology Dictionary*. Available at: www.etymonline.com/word/remove?ref=etymonline_crossreference#etymonline_v_10415 (accessed 24 February 2019).

Pallotti A (2017) Lost in transition? CCM and Tanzania's faltering democratisation process. *Journal of Contemporary African Studies* 35(4): 544-564.

Pellow DN (2007) *Resisting Global Toxics. Transnational Movements for Environmental Justice.* Cambridge, Massachusetts: The MIT Press.

Povinelli EA (2016) *Geontologies: A Requiem to late liberalism*. Durham and London: Duke University Press.

Pratt LA (2011) Decreasing dirty dumping? A reevaluation of toxic waste colonialism and the global management of transboundary hazardous waste. *William & Mary Environmental Law and Policy Review* 35(2): 582-623.

Robbins P (2007) *Lawn People: How Grasses, Weeds and Chemicals Make Us Who We Are*. Philadelphia: Temple University Press.

Rose G (2003) On the need to ask how, exactly, is geography "visual"? *Antipode* 35(2): 212-221.

Rose G and Tolia-Kelly DP (2012) *Visuality/Materiality: Images, Objects and Practices*. Farnham: Ashgate.

Rosenfeld H, Moore S, Nost E, et al. (2018) Hazardous aesthetics: a "merely interesting" toxic tour of waste management data. *GeoHumanities* 4(1): 262-281.

Shapiro N and Kirksey E (2017) Chemo-ethnography: An introduction. *Cultural Anthropology* 32(4): 481-493.

Shotwell A (2016) *Against Purity: Living Ethically in Compromised Times*. Mineeapolis: University of Minessota Press.

Sontag S (1979) *On Photography.* London: Penguin Books.

Stanes E and Gibson C (2017) Materials that linger: An embodied geography of polyester clothes. *Geoforum* 85: 27-36.

Strathern M (1999) *Property, Substance and Effect: Anthropological Essays on Persons and Things.* London: Athlone Press.

Suchman L (2007) *Human-Machine Reconfigurations: Plans and Situated Actions.* Cambridge: Cambridge University Press.

Tsing AL (2015) *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins.* Princeton and Oxford: Princeton University Press.

Weizman E and Weizman I (2015) *Before and After: Documenting the Architecture of Disaster.* Moscow: Strelka Press.

Williams B (2018) "That we may live": Pesticides, plantations, and environmental racism in the United States South. *Environment and Planning E: Nature and Space* 1(1-2): 243-267.

World Bank (2013) *Implementation, Completion, and Results Report for the Africa Stockpiles Program – Project 1*. Report no. ICR2682, 23 June. Washington DC: World Bank.

Plate 1: Condition inside Vikuge Store before clean up

Plate 2: Condition inside Vikuge Store after clean up

Figure 1: 'Before and after' photographs. ASP evaluation report, NEMC. 2013. Photographer/s: unknown. Source: Scanned copy from NEMC archive. Tanzania.

889x1219mm (40 x 40 DPI)

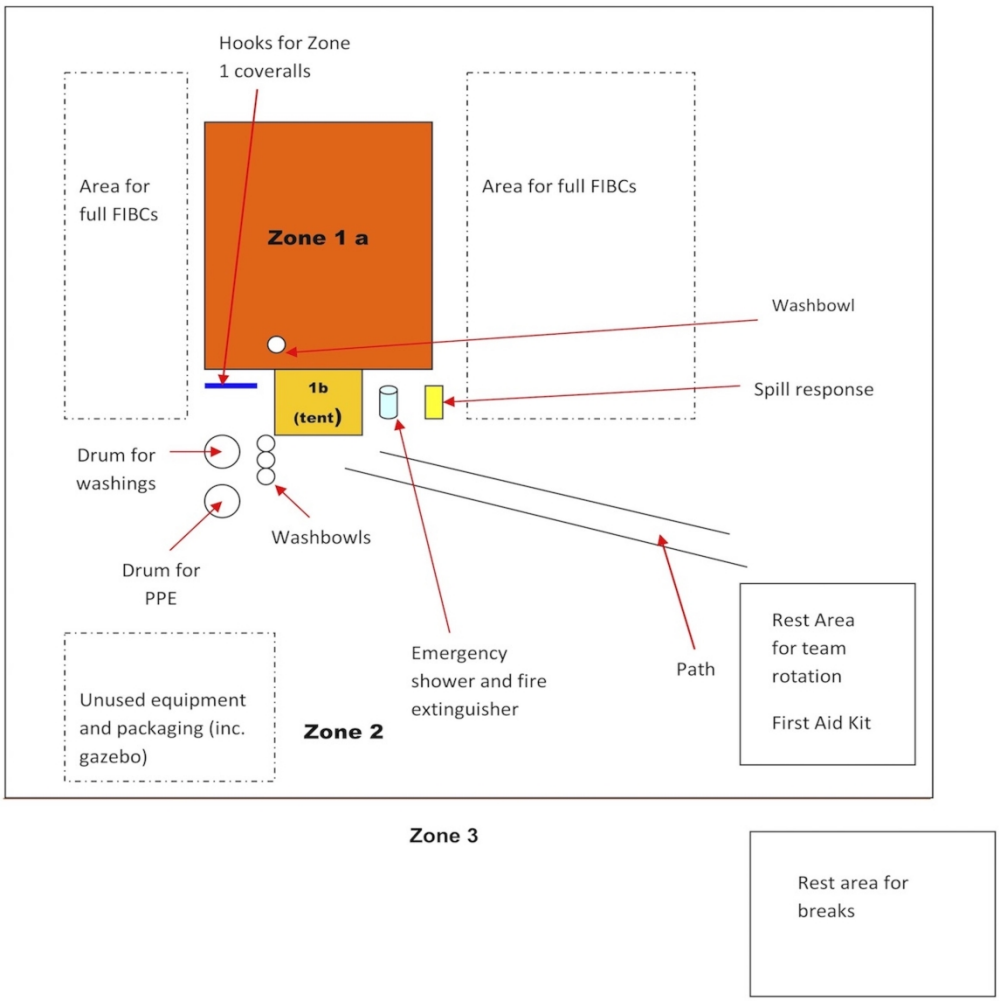

Figure 2: Diagram of stockpile site zones. From 'Site Specific Health Safety & Environment Management Plan'. 2012. Source: PDF in Veolia archive. Wales.

76x76mm (1000 x 1000 DPI)

Figure 3: Video still of workers containing pesticides in shed. 2012. Photographer: Alan. Source: Veolia archive. Wales.

564x423mm (72 x 72 DPI)